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The Effect of Drying Temperature to Chemical Components of Surian Herbal Tea Leaves (*Toona sureni,* (Blume) Merr.).

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ABSTRACT

This research has been carried out in the Laboratory of Agricultural Technology, Faculty of Agriculture, University of Andalas Padang in May 2014 to July 2014. The purpose of this study was to determine the effect of drying temperature on the chemical components of tea leaves for the work. The design used in this research was completely randomized design (CRD) with 5 treatments and 3 replications. Treatment that A (Surian leaves drying at temperature 50^0C), B (Surian leaves drying at temperature 60^0C), C (Surian leaves drying at temperature 70^0C), D (Surian leaves drying at temperature 80^0C), E (drying of leaves Surian at temperature 90^0C). Observations on the products include moisture content, ash content, the antioxidant activity, total polyphenols, compounds triterpenoids, flavonoids, phenols and tannins qualitatively. Data were analyzed by F test followed Duncan's test New Multiple Range Test (DNMRT) at the 5% significance level. The results showed that the difference in drying temperature significantly affected the moisture content, ash content, total polyphenols and antioxidant activity of the resulting product. From all the positive treatment Surian leaves tea contains compounds triterpenoids, flavonoids, phenols and tannins. Based on the results of chemical analysis products, it was found that the product with treatment D (Surian leaves drying at temperature of 80 0C) were the antioxidant activity of 55.55%, 8.36% total polyphenols, ash content of 5.24% and 4.11% moisture content.

Keywords: Surian Leaves, Chemicals Components, Temperature Drying, Tea Surian leaves.

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INTRODUCTION

Surian (*Toona sureni*, (Blume) Merr) is one of several plants used by the community for various purposes ranging from wood, stem until the leaves have been used traditionally [1]. In West Sumatra Surian, leaves are used to treat fever, as the drug in patients with diarrhea, dysentery and drug wound closure. In the health field, leaves red Surian used as medicine chronic diarrhea, dysentery and other intestinal diseases. Surian leaves can also be used to treat kidney swelling. Its skin can be used as essential oils, where it is biologically active as an antibacterial and antifungal, this component can be used as a preservative in foods and as a natural antibiotic [2].

Currently people tend to go back to nature (back to nature) by consuming products from natural ingredients to maintain health. One reason is the security for long-term use. To the use of traditional medicine [3]. Research on Surian (*Toona sureni*, (Blume) Merr.) Mentions that the leaves of this plant contains component that surenon tetranortriterpenoid, surenin, surenolakton, carotenoids consisting of zeasantin and triterpenoids which have antiplasmodial activity. These leaves contain chemical compounds called metal error has bioativity as antibacterial, antioxidant. In addition to methyl error Surian leaves also contain lutein carotenoid compounds that preventmacular damage the eyes of blue rays of the sun. The leaves also contain beta-sitosterol which has bioactivity cholesterol - LDL blood so as to prevent coronary heart disease [4].

Active component contained in Surian leaves can be used as material for functional beverages (tea). Functional drinks are kind of food product with functional characteristics disease protection, increased performance optimal body function and slow the aging process [5]. As a material for health drinks, leaves for the work can be processed into herbal tea leaves mimic Surian and processing stages of processing green tea leaves.

Antioxidants are compounds that have a molecular structure that can provide the free electron to the free radical molecules without being disturbed at all and can decide a chain reaction of free radicals [6].

Tea processing according [7] conducted by the tea factories in Indonesia with drying temperature range between 50^0C-85^0C temperature with 80-90 minutes drying time, drying temperature effect on the chemical components of tea are produced, higher drying temperature chemical constituents contained in the tea leaves will diminish and disappear as the content of antioxidants and others.

According [8], the active component in tea that has the most effective antioxidant capabilities are polyphenols. However, the polyphenol components are easily damaged by heat. Therefore, in the process of drying the tea leaves should be noted that the drying temperature is used, it aims to maintain the active components contained in tea leaves is maintained. Tea processing by using specific drying temperature greatly affects the chemical components contained in tea products produced. The purpose of this study was to determine the effect of drying temperature on the chemical components of tea leaves for the work.

MATERIAL AND METHODS

Materials

Raw materials used in this study is derived from the leaves Surian in Nagari Padang Laweh, Tanah Datar which has characteristic pale green, no bruises and sequence of shoots up to 6 of the tip of shoots. Chemicals used in this study were distilled, ethanol 96%, Follin-Ciocalteu reagent (50%), 7.5% Na_2CO_3, methanol, DPPH, anhydrous acetic acid, sulfuric acid, Mg powder and gallic acid.

Research Design

This study was designed using a completely randomized design (CRD) with 5 treatments and 3 replications. Data were analyzed by ANOVA, if significantly different then followed by Duncant test's New Multiple Range Test (DNMRT) at the 5% significance level. The treatments used in this study were the temperature of drying leaves for the work that were:

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A = Drying leaves Surian at 50 ^{0}C
B = Drying leaves Surian at 60 ^{0}C
C = Drying leaves Surian at 70 ^{0}C
D = Drying leaves Surian at 80 ^{0}C
E = Drying leaves Surian at 90 ^{0}C

Stages Research

Tea Surian leaves production [9].

a. Surian leaves plucking green colored reddish.
b. Withering Surian leaves for 12 hours at room temperature.
c. Milling using a blender until it resembles tea powder
d. Sieved using a 40 mesh sieve
e. Drying oven with a temperature treatment 50^{0}C, 60^{0}C, 70^{0}C, 80^{0}C and 90^{0}C until the moisture content of 3-6% with the characteristics of a yellowish green color and loose when squeezed and recorded drying time respectively.
f. Packaging and analysis.

OBSERVATION

The observations made are:

1. Analysis on Surian leaves which were: Terpenoids active compounds, flavonoids, phenols, tannins qualitatively and moisture content, ash content, total polyphenols, antioxidant activity.
2. Analysis on leaves tea leaves powder, which were :
   a) Long drying tea leaves for the work.
   b) Chemical analysis: moisture content, ash content, tannin levels, total polyphenols and antioxidant activity. Terpenoids active compounds, flavonoids, phenols, tannins qualitatively.

ANALYSIS METHODS

Water Content [10]

The initial phase was done to analyze the water content is drying dishes in the oven at a temperature of 102^{0}C for 60 minutes. The cup were placed into a desiccator for 15 minutes. The cup was measured (A). A total of 5 grams of sample is moved into the cup (B). Dry with using an oven at 102^{0}C for 6 hours or until its weight is constant. After completion of the process and then the cup containing the sample is inserted into a desiccator to cool and then weighed again (C).

The water content was calculated by the formula:

$$\text{Moisture Content (\%w/w)} = \frac{(B - C)}{B - A} x\ 100\%$$

Description: A = weight of empty cup (g)
B = weight of initial cup filled with the sample (g)
C = weight of dish with dried sample (g)

Ash Content [11].

The sample were weighed as much as 2 g in dry porcelain cup of known weight. Sample was burned upon heating to form charcoal destruction and no smoke again. Subsequently put in an electric furnace at a temperature of 550^{0}C for 3-5 hours until a whitish gray. Finally cool in a desiccator, sample was cooled down and measured.

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$$\text{Ash content (\%)} = \frac{\text{Weight after ashing (g)}}{\text{Weight before ashing (g)}} x\ 100\%$$

Total Polyphenols Content Test [12].

A total of 0.05 ml samples of tea leaves for the work put into a test tube, and then 1 ml of ethanol, 5 ml of distilled water, 0.5 ml Follin-Ciocalteu reagent (50%) were added to the test tube and divortek. After 5 minutes, into the reaction tube was added 1 ml of Na_2CO_3 (5%) and put in vortek that a homogeneous solution. The reaction mixture was conducted to stand in a dark place by way of using aluminum foil wrapped for 60 minutes and then the measured value of absorbance at 725 nm wavelength. Standard curve was constructed by replacing the sample with gallic acid were made with several concentrations. The content of total polyphenols in tea is expressed in mg/ml.

Antioxidant Activity by DPPH Test [13].

The antioxidant activity was analyzed based on its ability to capture free radicals (radical scavenging activity) DPPH. Prior to the measurement, as much as 1 gram of powdered tea leaves macerated Surian first with 10 ml of methanol in the reaction tube overnight. Then, it was filtered and the filtrate dilution three times with methanol. Then pipette 1 ml of dilution and added 2 ml of DPPH reagent and then inserted into a test tube. Divortek mixture and allowed to stand for 30 minutes, then the measured value of absorbance at 517 nm wave length using a spectrophotometer. Antioxidant activity expressed in% inhibition. The amount of antioxidant power was calculated using following formula:

$$\text{Antioxidant activity (\%)} = \frac{\text{Control Absorbance - Sample absorbance}}{\text{Control Absorbance}} \text{ x 100\%}$$

Active Compounds Test Terpenoids [14].

A total of 50-100 mg samples of tea that had been crushed, placed on a drip plate and acetic acid anhydride was added to the sample submerged everything, left for 15 minutes, 6 drops of solution was transferred into a test tube and add 2 drops of concentrated sulfuric acid. The presence of triterpenoids indicated by the pink color.

Test Active Flavonoid Compounds [14].

A total of 200 mg of tea samples that had been extracted with 5 ml of ethanol and heated for 5 minutes in a test tube. Furthermore, plus a few drops of concentrated HCl. Then added 0.2 g of Mg powder. A positive result were indicated by the occurrence of a deep red color (magenta) within 3 minutes.

Test Phenol Compounds [14].

A total of 21 mg samples of tea that has been mashed, plus ethanol until the sample is submerged everything. Then in 1 ml of solution was transferred into a test tube and add 2-3 drops of 1% $FeCl_3$. A positive result is indicated by the formation of a purplish brown color. Qualitative Test Tannins 0.5 gram sample is inserted into a test tube and then added 1-2 ml of water and 2 drops of $FeCl_3$%. When the final solution of the bluish green colored positive samples contain tannins.

RESULT AND DISCUSSION

Analysis of Raw Materials Chemical analysis carried out on raw materials for the work leaves covering the phytochemical analysis of triterpenoid compounds, flavonoids, phenols, tannins qualitatively, moisture content, ash content, total polyphenols and antioxidant activity. The results of chemical analysis on the leaves for the work can be seen in Table 1 and 2.

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Table 1. Results of Phytochemical Analysis Surian Leaves

Analysis	Results Description
Triterpenoid	+ (Pink color is formed)
Flavonoid	+ (Dark red color formed)
Fenol	+ (purplish brown coloration)
Tanin	+ (bluish green coloration)

Table 2. Results of Chemical Analysis Surian Leaves

Parameter	Surian Leaves (%)
Water Content	54,07
Ash Content	3,26
Total Polyphenols	9,11
Antioxidant Activity	62,50

Phytochemical analysis performed on Surian leaves by adding acetic acid anhydride reagent in Surian cause discoloration of the leaves dark green to pink, this proves that Surian leaves contain triterpenoid compounds. The addition of magnesium metal and concentrated hydrochloric acid produces a deep red color on the leaves for the work, this indicates that the leaves Surian containing flavonoids. The addition of 1% $FeCl_3$ causing a purplish brown color indicates that the leaves Surian contains phenolic compounds. Results of the study also showed positive Surian leaves color change to green bluish after addition of iron (III) chloride 1%. The results of the analysis of the levels of antioxidants in Surian leaves extract at a concentration of 1000 ppm indicate the presence of the antioxidant content of 62.50% and total polyphenols contained in the extract of leaves Surian 9.11%. This indicates that the antioxidants and polyphenols contained in the leaves quite a lot for the work, which according to the Tea Research Association [15] antioxidants found in fresh green tea is 25-30%.

Analysis of Surian Leaves Tea

Drying Old Tea Surian Leaves

The higher the temperature the faster the drying is used the drying time of a material, and vice versa. The time required for drying the tea leaves for the work can be seen in Table 3.

Table 3. Drying Old Herbal Tea Surian Leaves

Treatment	Drying Long (minutes)
A (Drying leaves Surian at temperature 50^{0}C)	360 minutes
B (Drying leaves Surian at temperature 60^{0}C)	240 minutes
C (Drying leaves Surian at temperature 70^{0}C)	120 minutes
D (Drying leaves Surian at temperature 80^{0}C)	90 minutes
E (Drying leaves Surian at temperature 90 ^{0}C)	70 minutes

Calculation Surian leaves tea drying time is calculated based on the characteristics of the leaves dry Surian that has a water content of 3-6% is Surian golden yellow leaves and crushed if broken with fingers. The higher the temperature the faster the drying is used the drying time. During the drying takes the evaporation of water in the material so that the faster the water content decreases.

Water Content

Water content of tea leaves for the work ranged from 3.43% - 6.30%. Low water levels on treatment E with temperature 90^{0}C of 3.43% and the highest water levels on treatment A with a temperature of 50^{0}C at 6.30%. The average yield of tea leaves water content for the work can be seen in Table 4.

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Table 4. Results Mean Herbal Tea Leaves Water Content Surian

Treatment	Water Content (%)
A (Drying leaves Surian at temperature 50 ^{0}C)	6,30 ± 0,09 a
B (Drying leaves Surian at temperature 60 ^{0}C)	5,54 ± 0,30 b
C (Drying leaves Surian at temperature 70 ^{0}C)	4,62 ± 0,33 c
D (Drying leaves Surian at temperature 80 ^{0}C)	4,11 ± 0,02 d
E (Drying leaves Surian at temperature 90 ^{0}C)	3,43 ± 0,22 e
CV = 3,16 %	

The numbers in the same column followed by the same lowercase letter are not significantly different according to DNMRT at the 5% significance level.

The results of the analysis of water content Surian leaves tea is green tea meet quality requirements according to (SNI 01-4453-1998) [16] is a maximum of 8%. If the moisture content of more than 8%, then the material will be a good medium for microbial growth. The lower the water content of tea powder produced the shelf will be longer.

Low water levels can be affected by several factors such as temperature drying, long drying time and the type of raw material. Increasing the temperature of the drying effect on the decrease in the water content of tea leaves for the work. This is because, the higher the temperature used in the drying process the less time spent and the resulting moisture content of a material decreases even lost due to evaporate so that the appropriate drying temperature needed to prevent a decline in the nutritional value of a material. This is consistent with the statement [17], that the drying process is greatly influenced by temperature and drying time. The higher the temperature of drying a substance has a lower water content. However, the higher temperatures used in the drying process faster drying time required.

Water is a major component in food as it can affect the texture, appearance, and flavor of a food. Water levels determine the shelf life of food because the water content influences the physical properties and the properties of the physico-chemical, chemical changes, changes in enzymatic and microbiological damage [18].

Ash Content

Value tea leaves ash content of 3.60% for the work ranged from - 5.24%. Low ash content in treatment A with a temperature of 50^{0}C at 3.60% and ash content of the highest in treatment D with a temperature of 80^{0}C at 5.24%. The average yield of ash content of tea leaves with various treatments for the work can be seen in Table 5.

Table 5. Results of Average Levels of Abu Tea Surian Leaves

Treatment	Ash Content (%)
D (Drying leaves Surian at temperature 80 ^{0}C)	5,24 ± 0,96 a
E (Drying leaves Surian at temperature 90 ^{0}C)	4,88 ± 0,50 b
C (Drying leaves Surian at temperature 70 ^{0}C)	4,84 ± 0,49 b
B (Drying leaves Surian at temperature 60 ^{0}C)	4,57 ± 0,11 c
A (Drying leaves Surian at temperature 50 ^{0}C)	3,60 ± 0,33 d
CV = 10,52 %	

The numbers in the same column followed by the same lowercase letter are not significantly different according to DNMRT at the 5% significance level.

The results of the analysis of the ash content Surian leaves tea is tea meet quality requirements according to (SNI 01-4453-1998) is a maximum of 8%. Increased drying temperature causes an increase in ash content in tea leaves for the work, because with increasing temperature resulted in decreased water content,

so the more residue left in the material. The moisture content of dried foods will decrease and cause a higher concentration of the remaining ingredients one mineral [19].

Foodstuffs consists of 96% organic matter and water, while the rest is mineral elements. Organic materials in the combustion process will burn but not burned mineral components. Mineral components were not burned. This component is known as an ash content [18]. The higher the drying temperature, will increase the ash content as the corresponding increase in temperature in the drying process does not result in the destruction of food nutrients, especially minerals, only reduce the water content of food alone [20].

Total Polyphenols

The value of the total polyphenol content of the tea leaves for the work ranged from 2.51% - 8.36%. The lowest levels of total polyphenols in treatment E at temperature 90^0C of 2.51% and the highest levels of total polyphenols in treatment D at temperature 80^0C 8.36%. Average yield of total polyphenol content of the tea leaves for the work with a variety of treatments can be seen in Table 6.

Table 6. Results of Average Total Polyphenols Tea Surian Leaves

Treatment	Total Polyphenols (%)
D (Drying leaves Surian at temperature 80 0C)	8,36 ± 0,49 a
C (Drying leaves Surian at temperature 70 0C)	7,61 ± 0,49 b
B (Drying leaves Surian at temperature 60 0C)	5,57 ± 0,11 c
A (Drying leaves Surian at temperature 50 0C)	2,93 ± 0,33 d
E (Drying leaves Surian at temperature 90 0C)	2,51 ± 1,23 d
CV= 15,77%	

The numbers in the same column followed by the same lowercase letter are not significantly different according to DNMRT at the 5% significance level.

Levels of total polyphenols obtained increased with increasing drying temperature and then stabilized and tends to decrease again (figure 2). Because the levels of polyphenols in it is damaged due to high temperature drying and long drying time is used. Drying temperature affects the total polyphenol content of tea leaves for the work. This is in accordance with the [8] that the polyphenol components are easily damaged by heat. In this study, the highest total polyphenols in treatment D 8.36% in phytochemical analysis of the results obtained in the tea leaves that are Surian active compounds terpenoids, flavonoids and phenols.

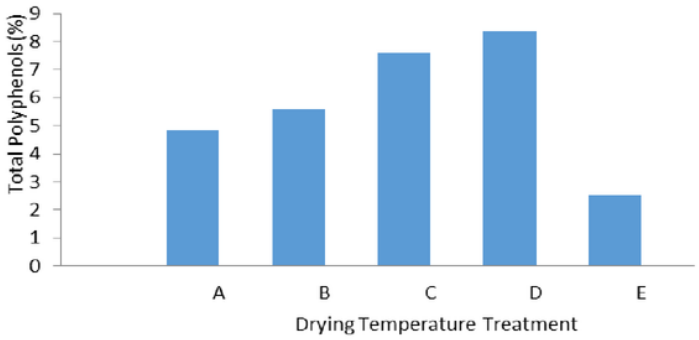

Figure 2. Effect of Temperature Drying Of Total Polyphenols Tea Leaves Surian

Based on the pictures Total polyphenols increased with increasing drying temperature to a certain extent so that the total polyphenol detected will peak and then a constant maximum and then decreases. This is consistent with the statement [21], that the polyphenol content increases with increasing temperature

drying to a certain extent and then constant and then decreases. Figure 2 Total polyphenols increased with increasing drying temperature to a certain extent so that the total polyphenol detected will peak and then a constant maximum and then decreases. This is consistent with the statement [21], that the polyphenol content increases with increasing temperature drying to a certain extent and then constant and then decreases.

Antioxidant Activity

Value of antioxidant activity of tea leaves for the work ranged between 43.37% - 55.55%. Lowest antioxidant activity in treatment A with a temperature of 50^{0}C 43,75% and the highest levels of antioxidant activity in treatment D with a temperature of 80^{0}C at 55.55%. The average yield of antioxidant activity of tea leaves for the work with a variety of treatments can be seen in Table 7.

Table 7. Results of Average Activity Antioxidant Herbal Tea Surian Leaves

Treatment	Antioxidant Activity (%)
D (Drying leaves Surian at temperature 80 ^{0}C)	55.55 ± 0.66 a
C (Drying leaves Surian at temperature 70^0 C)	53.85 ± 1.94 a
B (Drying leaves Surian at temperature 60^0 C)	49.62 ± 0.68 b
E (Drying leaves Surian at temperature 90^0 C)	49.05 ± 0.26 b
A (Drying leaves Surian at temperature 50^0 C)	43.75 ± 0.38 c
CV= 1,71 %	

The numbers in the same column followed by the same lowercase letter are not significantly different according to DNMRT at the 5% significance level.

Antioxidants are found in the leaves Surian are polyphenols, and flavonoids. Antioxidants damaged due to oxidation reactions that occur. Antioksidan oxidation reaction are compounds that can inhibit oxidation reactions by binding free radicals and highly reactive molecules. The antioxidant activity is the ability of a material containing antioxidants to be able to dampen free radical compounds [22].

Antioxidant properties are easily damaged by light and high temperature. The higher the temperature and duration of drying the antioxidant activity produced higher until a certain time limit, then decreased [23]. This can be seen in Figure 3, that the temperature of the drying effect on the antioxidant activity of tea leaves for the work.

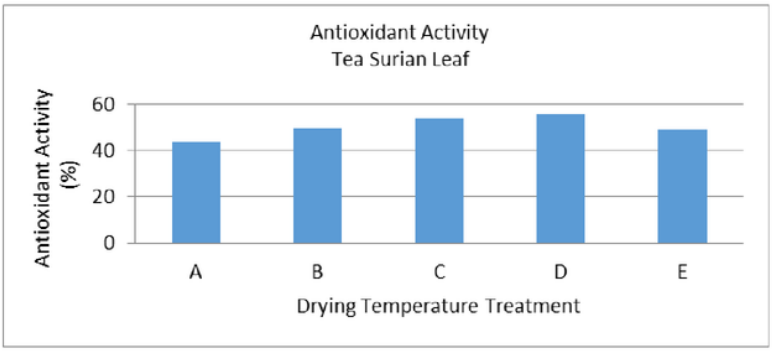

Figure 3. Effect of Drying Temperature Leaves Tea Antioxidant Activity Against Surian

The antioxidant activity expressed as percent by inhibiting free radical antioxidant compounds contained in the material. The higher the antioxidant activity, the greater the ability of antioxidants to counteract free radical compounds that can prevent oxidative damage and the formation of a chain reaction that causes degenerative diseases [24].

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Test Qualitative Phytochemical Compounds

The results of a qualitative test for the active compounds terpenoids, flavonoids and tannins phenol Surian leaves herbal teas produced showed that the herbal tea leaves contained Surian active compounds terpenoids, flavonoids, tannins and phenols marked by a change in color reaction occurs. Phytochemical analysis results can be seen in Table 8

Table 8. Results of phytochemical analysis of tea Surian leaves

Treatment	Observation Result (Change the color of the solution + reagent)			
	Triterpenoid	Flavonoid	Fenol	Tanin
A	+(pink)	+ (dark red)	+(brown-purple)	+(bluish green)
B	+(pink)	+ (dark red)	+(brown-purple)	+(bluish green)
C	+(pink)	+ (dark red)	+(brown-purple)	+(bluish green)
D	+(pink)	+ (dark red)	+(brown-purple)	+(bluish green)
E	+(pink)	+ (dark red)	+(brown-purple)	+(bluish green)

Description: (+) indicates a solution containing the active compound

Based on the results of a qualitative test, the active compound herbal tea leaves Surian by adding anhydrous acid reagent in leaves extracts obtained Surian light brown color changes to pink prove that Surian leaves contain triterpenoid compounds. The addition of concentrated HCl + Mg powder that causes dark red color on the leaves for the work which indicates that the leaves extract contains flavonoids Surian. The addition of 1% FeCl3 causing a purplish brown color indicates that Surian leaves extract contains phenolic compounds. The addition of iron (III) chloride 1%. which cause a bluish green color indicates that the leaves contain tannin Surian.

Active compounds terpenoids, flavonoids and phenolic compounds are secondary metabolites that are expected to have activity as free radical because functional groups present in the compound as the OH group in solving heterolitiknya will produce radical O (O) and H radicals (H.). This radicals will react with DPPH radicals that can reduce the wavelength of the DPPH

CONCLUSIONS

Based on research that has been done can be concluded as follows:

1. The rate of drying temperature Surian leaves tea to give effect to the chemical components of the water content, ash content, antioxidant activity and total polyphenol product. And the tea leaves contain compounds positive Surian triterpenoids, flavonoids, phenols and tannins.
2. Chemical analyzes were obtained on Surian leaves tea is the water content of 3.43% - 6.30%, ash content of 3.60% - 5.24%, 2.51% total polyphenols - 8.36% and antioxidant activity 43.75% - 55.55%.
3. The best products based on the results of the chemical analysis is a product with treatment D (Surian leaves drying at a temperature of 80^0C) ie 55.55% antioxidant activity, total polyphenols 8.36%, ash content of 5.24% and 4.11% water content.

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